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EXAMINER	
STEVENS, THOMAS H	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 03/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/608,526	DI ET AL.	
	Examiner	Art Unit	
	Thomas H. Stevens	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 November 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-28* is/are pending in the application.

4a) Of the above claim(s) *5,29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4 and 6-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-4 and 6-28 were reviewed.

Response to Arguments (2nd action)

Drawings

2. Objection is withdrawn.

35 USC § 101

3. Applicants are thanked for addressing this issue. The amendments to in question do not place claims 11-22 in statutory status for the same reasons stated before which recite an abstract mathematical algorithm (i.e., predicting a likelihood of an item) with no hint of post-solution activity by the invention itself. The phrase "a system memory of a computer system and an extended memory of the computer system" is an ancillary feature, which does not fulfill the teaching of a post-solution activity event. Rejection stands.

35 USC § 112 2nd

4. Applicants are thanked for addressing this issue. Rejection is withdrawn.

35 USC § 102

5. Applicants are thanked for addressing this issue. Applicant's arguments in light of the 102(b) rejection is persuasive, thus rejection is withdrawn.

Final Rejection (3rd Office Action)

Claim Rejections - 35 USC § 101

6. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. Claims 11-16 and 17-22 are rejected under 35 U.S.C. 101 because the claimed invention is reciting abstract mathematical algorithm with no definitive solution (i.e., "predicting a likelihood..."). The examiner respectfully submits that the applicants have not claimed a practical application. An invention which is eligible for patenting under 35 U.S.C. § 101 is in the "useful arts" when it is a machine, manufacture, process or composition of matter, which produces a concrete, tangible, and useful result. The examiner respectfully submits, under current PTO practice, that the claimed invention does not recite a tangible or concrete result.

Claim Rejections - 35 USC § 103

8. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 1-4,6-28 are rejected under 35 U.S.C. 103(c) as being obvious by Marquez ("Statistical Learning" (1999)) in view of Kupiec (U.S. Patent 5,696,962 (1997)). Marquez teaches a statistical learning process to identify data structures; but doesn't teach corpus involving computer memory. Kupiec teaches a computerized method for retrieving documents from text corpus in response to a user-supplied natural language input.

At the time of invention, it would have been obvious to one of ordinary skill in the art to modify Marquez by way of Kupiec since it would be advantageous to have a computerized information retrieval from a text corpus in response to a natural-language input string supplied by the user (Kupiec: columns 1 and 2, lines 65-67,1-2, respectively).

Claim 1: A method comprising: assigning each of a plurality of segments comprising a received corpus to a node in a data structure denoting dependencies between nodes (Marquez: slide 24); calculating a transitional probability between each of the nodes in

the data structure (Marquez: slide 25); and managing storage of the data structure (Kupiec: column 42, lines 13-23) across a system memory of a computer system (Kupiec: column 6, lines 29-31) and an external memory of the computer system.

Claim 2: A method according to claim 1 (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23), further comprising: calculating a frequency of occurrence (Marquez: slide 2, bullets 1 and 2) for each elemental item of the segment; and removing nodes of the data structure associated with items which do not meet a minimum frequency threshold (Kupiec: column 14, lines 11-14) for the frequency of occurrence (Marquez: slide 24).

Claim 3: A method according to claim 2 (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23; Marquez: slide 2, bullets 1 and 2; Kupiec: column 14, lines 11-14) wherein the frequency of the item is calculated by counting item occurrences throughout the subset and/or corpus (Kupiec: column 14, lines 11-14).

Claim 4: A method according to claim 2, (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23; Marquez: slide 2, bullets 1 and 2; Kupiec: column 14, lines 11-14) wherein the minimum threshold is three (Marquez: slide 24).

Claim 6: A method according to claim1, (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23) wherein the step of managing storage of the data

(Kupiec: column 42, lines 13-23) structure comprises: identifying least recently used nodes of the data structure; and storing the least recently used nodes of the data structure in the extended memory of the computer system when the data structure (Kupiec: column 6, lines 29-31) is too large to store completely within the system memory.

Claim 7: A method according to claim 6, (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23; Kupiec: column 6, lines 29-31) wherein the extended memory of the computer system comprises one or more files on an accessible mass storage device (Kupiec: column 6, lines 30-45).

Claim 8: A method according to claim 7, (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23; Kupiec: column 6, lines 29-31; Kupiec: column 6, lines 30-45) wherein the data structure represents to a language model, spread across one or more elements of a computing system memory subsystem (Kupiec: column 6,lines 49-57).

Claim 9: A method according to claim 1, (Marquez: slides 24,25, 35; Kupiec: column 6, lines 29-31; column 42, lines 13-23) wherein calculating a transition probability includes calculating a Markov transitional probability between nodes (Marquez: slide 24).

Claim 10: A storage medium (Kupiec: column 6, lines 29-35) comprising a plurality of executable instructions including at least a subset of which that, when executed by a processor, implement a method according to claim 1 (Marquez: slides 24 and 35).

Claim 11: A method for predicting a likelihood of an item in a corpus comprised of a plurality of items, the method comprising (Marquez: slide 12, bullet 1): building a data structure, across a system memory of a computer system and an extended memory of the computer system (Kupiec: column 6, lines 29-31), of corpus segments representing a dynamic context of item dependencies within the segments (Marquez: slide 14); calculating the likelihood of each item based, at least in part, on a likelihood of preceding items within the dynamic context (Marquez: slide 14 and 18); iteratively re-segmenting the corpus (Marquez: slide 14 and 18); and predicting a likelihood of an item in the re-segmented corpus (Marquez: slide 14 and 18).

Claim 12: A method according to claim 11, (Marquez: slide 12, bullet 1; Kupiec: column 6, lines 29-31; Marquez: slide 14,18) wherein the method of building a dynamic context of preceding dependent items comprises (Marquez: slide 14 and 18): analyzing the data structure representing the language model (Marquez: slides 2 and 20); identifying all items with dependencies to or from the item (Marquez: slides 20 and 21); and a using all items with dependencies to or from the item as the dynamic context

Claim 13: A method according to claim 11(Marquez: slide 12, bullet 1; Kupiec: column 6, lines 29-31; Marquez: slide 14,18), wherein the language model includes frequency (Marquez: slide 2, bullets 1 and 2) information for each item within the model.

Claim 14: A method according to claim 13 (Marquez: slide 12, bullet 1; Kupiec: column 6, lines 29-31; Marquez: slide 14,18; Marquez: slide 2, bullets 1 and 2), wherein calculating the likelihood of the item comprises: calculating a Markov transition probability for the item based, at least in part, on the frequency of the items comprising the dynamic context (Marquez: slides 24, 25 and 26 bullets 2 and 3).

Claim 15: A method according to claim 11(Marquez: slide 12, bullet 1; Kupiec: column 6, lines 29-31; Marquez: slide 14,18), wherein calculating the likelihood of the item comprises: calculating a Markov (Kupiec: column 8, lines 49-52) transition probability for the item given the dynamic context of items (Marquez: slides 24, 25 and 26 bullets 2 and 3).

Claim 16: A storage medium having stored (Kupiec: column 6, lines 29-35) thereon a plurality of executable instructions including instructions which, when executed by a host computer implement a method according to claim 11(Marquez: slides 2 and 20).

Claim 17: A data structure (Kupiec: columns 1 and 2, lines 65-67, 1-5), generated by a computer system as a statistical language model (Marquez: slide 2, bullet 2), the data structure comprising: one or more root nodes (Marquez: slide 7a and 7b); and a plurality

of subordinate nodes, ultimately linked to a root node, cumulatively comprising one or more sub-trees (Marquez: slide 36), wherein each node of a to sub-tree represents one or more items of a corpus and includes a measure of a Markov transition (Marquez: slide 24) probability between the node and another linked node.

Claim 18: A data structure according to claim 17 (Kupiec: columns 1 and 2, lines 65-67, 1-5;Marquez: slide 2, bullet 2; and slide 7a and 7b), wherein the root node represents a common root item for all subordinate nodes in the one or more sub-trees (Marquez: slide 14, last bullet).

Claim 19: A data structure according to claim 17 (Kupiec: columns 1 and 2, lines 65-67, 1-5;Marquez: slide 2, bullet 2; and slide 7a and 7b), wherein the Markov is transition probability is a measure of the likelihood of a transition from one node to another node based, at least in part, on the one or more items represented by each of the nodes (Marquez: slide 24).

Claim 20: A data structure according to claim 17 (Kupiec: columns 1 and 2, lines 65-67, 1-5;Marquez: slide 2, bullet 2; and slide 7a and 7b), wherein the items include one or more of a character, a letter, a number, and combinations thereof.

Claim 21: A data structure according to claim 17, (Kupiec: columns 1 and 2, lines 65-67, 1-5;Marquez: slide 2, bullet 2; and slide 7a and 7b) wherein the data structure

represents a dynamic order Markov model (DOMM) language model of the textual source.

Claim 22: A storage medium (Kupiec: column 6, lines 29-35) comprising a plurality of executable instructions which, when executed by a processor, implement a data structure according to claim 17(Marquez: slide 2, bullet 2; slide 7a and 7b).

Claim 23: A memory subsystem (Kupiec: column 6, lines 29-35; 46-57) in a computer system including one or more of a cache memory (Kupiec: column 27, lines 25-27), a system memory and extended memory having information stored therein which (Kupiec: column 6, lines 29-31), when interpreted by a processor of the computer system; represent a data structure according to claim 17 (Marquez: slide 7a and 7b).

Claim 24: A modeling agent comprising: a controller, to receive a corpus (Marquez: slide 12, bullet 1); and a data structure generator, responsive (Kupiec: column 40, lines 26-46) to and selectively invoked by the controller, to assign each of a plurality of segments comprising the received corpus to a node in a data structure denoting dependencies between nodes (Marquez: slides 24 and 29); wherein the modeling agent calculates a transitional probability between each of the nodes of the data structure to determine a predictive capability of a language model represented by the data structure and iteratively re-segments the received corpus until a threshold predictive capability (Kupiec: column 13, lines 60-63) is reached (Marquez: slides 18 and 24).

Claim 25: A modeling agent according to claim 24 (Marquez: slide 12, bullet 1; Marquez: slides 24 and 29; Kupiec: column 13, lines 60-63; Marquez: slides 18 and 24), the data structure generator comprising: a dynamic segmentation function (Marquez: slide 14 and 18), to iteratively re-segment the received corpus to improve language model predictive capability (Marquez: slides 18 and 24).

Claim 26: A modeling agent according to claim 24 (Marquez: slide 12, bullet 1; Marquez: slides 24 and 29; Kupiec: column 13, lines 60-63; Marquez: slides 18 and 24), the data structure generator comprising: a frequency analysis function to analyze a frequency of occurrence (Kupiec: column 13, lines 60-63) of segments within the corpus (Marquez: slides 18 and 24).

Claim 27: A modeling agent according to claim 26 (Marquez: slide 12, bullet 1; Marquez: slides 24 and 29; Kupiec: column 13, lines 60-63; Marquez: slides 18 and 24; Marquez: slides 18 and 24), wherein segments that do not meet a frequency of occurrence threshold are removed from the data structure, reducing data structure size and improving language model predictive capability (Marquez: slide 20).

Claim 28: A storage medium (Kupiec: column 6, lines 29-35) comprising a plurality of executable instructions including at least a subset of which, when executed, implement a language modeling agent to assign each of a plurality of segments of a received

corpus (Marquez: slides 18, 20, 24) to a nodes in a data structure denoting dependencies between nodes (Marquez: slides 24 and 29), and to calculate a transitional probability between each of the nodes in the data structure to determine a predictive capability of a language model denoted by the data structure, wherein the modeling agent dynamically re-segments the received corpus to remove segments which do not meet a minimum frequency threshold (Kupiec: column 15, lines 23-29) to improve one or more language model performance attributes.

Claim 29: A storage medium according to claim 28 (Kupiec: column 6, lines 29-35; Marquez: slides 18, 20, 24; Marquez: slides 24 and 29; Kupiec: column 15, lines 23-29) wherein the one or more language model performance attributes include a predictive capability.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Tom Stevens whose telephone number is 571-272-3715, Monday-Friday (8:00 am- 4:30 pm) or contact Supervisor Mr. Kevin Teska at (571) 272-3716. Fax number is 571-273-3715.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100.

March 16, 2005

THS

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER